# PLANT PROTECTION BULLETIN

A Publication of the
WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

VOL. I, No. 2 NOVEMBER 1952

## CONTENTS



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME, ITALY

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### 1952

### Volume I - Number I

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### A RECONSIDERATION OF THE ECONOMICS OF THE INTERNATIONAL WHEAT AGREEMENT

### prepared by FAO of the United Nations for the Consideration of the International Wheat Council in April, 1952

This paper is a study of the International Wheat Agreement as a means towards stabilizing the economics of the wheat market to protect producer and consumer from the fluctuations usual to a free market.

The first section of the paper sets forth the basic objectives of the Agreement, its implementation, and principles for the determination of prices. The second section, a series of appendices with charts, covers the problem of price fluctuations, numerical illustration of price formulae, an outline of domestic policies in participating countries and statistical data relating to the operation of the Agreement, 1949-51. The last section consists of tables showing statistics on purchases, sales, imports and exports under the Agreement in specific years, proportion of state and controlled private trading in participating countries, wheat market prices in particular countries and periods, and other relevant data.

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# FAO Plant Protection Bulletin

VOL. I, NO. 2 A Publication of the NOVEMBER 1952

World Reporting Service on Plant Diseases and Pests

## Plant Disease Situation in the United States

PAUL R. MILLER

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### *Downy Mildews*

MOST of the readers of this Bulletin probably know that in 1947 the United States initiated a National Plant Disease Reporting Service dealing primarily with downy mildew diseases.

The current growing season of 1952 has been considered a relatively light year, generally, for the presence and development of these diseases, which include late blight of potato and tomato (*Phytophthora infestans* (Mont.) D. By.), blue mold of tobacco (*Peronospora tabacina* Adam), and downy mildew of cucurbits (*Pseudoperonospora cubensis* Berk. and Curt.). Efficient and very generally used control measures, as in the case of blue mold of tobacco, and the unfavorable weather conditions for disease development, such as cool, dry weather or the drought that prevailed in the eastern half of the country during early summer, contributed to the non–appearance or non–development and spread of these diseases. In the Midwest, however, heavy dews seem to aid the initiation and development of potato and tomato late blight this year.

Appearance of late blight of potato was earlier than usual, in fact the earliest recorded in Louisiana. In Georgia, South Carolina and Indiana late blight developed on tomato transplants shipped in from the green–wrap tomato–growing areas of Florida.

In the early part of the season tobacco was heavily attacked by blue mold. However, later incidence was light owing to the absence of prolonged optimum conditions for blue mold development and also to the employment of good control programs in many of the States. For the most part downy mildew of cucurbits attacked plants after the crop was mature and ready to be harvested, or was held in check by dry, warm weather.

Consistent use of good control practices was successful in controlling tobacco blue mold in much of the tobacco–growing area this year. Some growers followed a bi–weekly control program, and in some cases fungicides were applied after every rain in addition to the regular schedule.

Fungicides recommended were 6.5 percent zineb dust or a 15 percent ferbam dust applied on a bi–weekly schedule or tri-weekly at dosages ranging from 15 to 35 pounds per acre.

Soil fumigation was commonly employed in eastern North Carolina and in South Carolina. It was estimated that perhaps 10,000 acres have been treated this year in the two States, which probably amounts to about 10 times as much tobacco land fumigated in 1952 as in 1951. Most of the treatment was with a DD mixture, but Dow W–85 with plough–sole application was extensively used in eastern North Carolina.

### *Septoria Black Stem on Oats*

Septoria black stem (*Leptosphaeria avenaria* Weber) attained the status of a major oat disease in 1952. Some was reported in 1950 and more in 1951, but this year an epidemic outbreak reduced yield and quality in many important oat–growing sections in Iowa, the Dakotas, Minnesota and Wisconsin.

A main feature of the epidemic was infection and darkening of the caryopses, which was prevalent enough to render unfit for milling much of the commercial oat supply

from several of the mozt productive States. Presence of only a few of these black groats spoils a lot for breakfast food. Since mixing of damaged and Septoria–free crops is likely to occur in elevators and shipment, it will probably be difficult to obtain oats fit for processing.

### *Take-All Discovered in Georgia*

Wheat take–all (*Gaeumannomyces graminis* (Sacc.) v. Arx and Olivier = *Ophiobolus graminis* Sacc.) was observed in a Georgia planting during the spring of 1952. Known range on the Atlantic Coast hitherto has been from New York to North Carolina, but records as far south as North Carolina are uncommon and the Georgia report represents a considerable southward extension.

### *Dwarf Bunt on Oatgrass*

A serious outbreak of dwarf bunt in the Tualatin variety of tall oatgrass (*Arrhenatherum elatius* (L.) Presl. var. *bulbosum* (Willd.) Spenner) was observed in Oregon fields inspected for seed certification in June. Dwarf bunt has been considered to be a race of *Tilletia caries* (DC.) Tul., but was recently described as a separate species, *T. brevifaciens* G. W. Fischer.

Its known occurrence up to now had been confined to the tribe Hordeae, including wheat and others, but this report on a member of the tribe Avenae suggests a wider host range. Dwarf bunt was also seen on several wheatgrasses (*Agropyron*) in 1952. In areas where it occurs, it is a serious menace to production of seed of various forage grasses. Measures are being taken to prevent dissemination of the bunt in grass seeds produced in Oregon.

### *Washing Reduces Cherry Decay*

Experiments in California proved the truth of a grower's report that cherries washed with water after picking kept considerably longer than unwashed cherries. Lambert and Royal Ann cherries were washed for about ten seconds four successive times in plain tap water. In most trials 0.1 pe cent Triton B1956 (phthalic glyceryl alkyd resin of Rohm and Haas Co.) was added as a detergent in the first two washes and had some additional protective action, but reduction in decay resulted without its use also. The principal fungi present were species of *Botrytis*, *Monilinia*, and *Penicillium*.

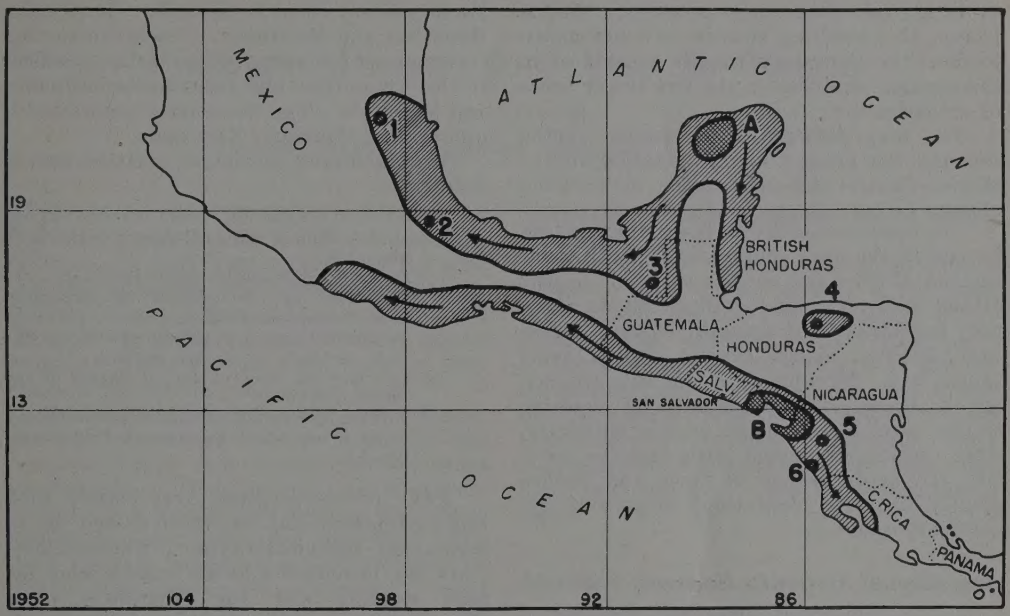
# The Locust Problem in Central America and Mexico

E. Morales Agacino
Expanded Technical Assistance Program, FAO

The locust problem in Central America and Mexico, as distinct from problems created by grasshopper species of minor importance, is caused by a locust of the migratory type. Since intensive studies of the problem were initiated only a few years ago, we have not as yet been able to make specific statements. However, a series of facts and observations which have become known recently have enabled us to form an opinion as to its status in this extensive region.

The insect which creates the problem is a species of the well–known genus *Schistocerca*, tentatively classified for practical purposes as *S. paranensis* Burm. This insect presents a series of variable characters of every type, which leads us to suppose that it may constitute a special race rather different from the locust that year after year invades the rich regions of South America.

As a migratory species, subject to phase changes, it has two definite gregarization areas of great interest in the Central America–Mexico region. One is located in the Mexican state of Yucatan, and the other appears to be situated in regions of El Salvador, Honduras and Nicaragua which surround the Gulf of Fonseca.




PROVISIONAL MAP SHOWING THE LOCUST SITUATION IN MEXICO–CENTRAL AMERICA.

Shaded areas indicate approximate areas of maximum invasion. Arrows indicate the routes of dispersion. A.–B. indicate areas of gregarization: A. Area in the state of Yucatan; B. Area along the Gulf of Fonseca. 1–6. indicate foci of gregarization: 1. Focus in Huastecas; 2. Focus in Cosolapa; 3. Focus in Peten; 4. Focus in Yoro; 5. Focus in Tisma– Masaya; 6. Focus in Rivas.

The first gregarization area in the State of Yucatan appears to give origin to swarms which fly west and north thus occupying almost all the tropical zone and part of the areas adjacent to the Gulf of Mexico. This same area also produces the swarms which fly south, cross the Aztec territory of Quintana Roo, and invade British Honduras and probably part of Guatemala.

The second gregarization area along the Gulf of Fonseca produces the swarms which, after remaining a while within the area, fly in two opposite directions. Swarms of one group traverse El Salvador, the Pacific coastal zone of Guatemala and enter Mexico through the state of Chiapas. From here they fly toward the isthmus of Tehuantepec where they may divide into two branches. Some fly towards the coast of their origin, while others proceed towards the Atlantic coast. Swarms of the second group fly southward into Nicaragua and occasionally enter the productive regions of Costa Rica.

Independent of these two areas of gregarization, there exist in Mexico and Central America a series of uncertain foci of gregarization of variable origin and significance. Of these, foci in Huastecas and Cosolapa affect Mexico; focus in Peten affects the Mexican state of Peten and Guatemala; focus in Yoro affects Honduras; and foci in Tisma–Masaya and Rivas affect Nicaragua. Some are of great interest since they may become a serious problem to all countries in the Mexico–Central America region.

Within both areas of gregarization in the state of Yucatan and around the Gulf of Fonseca, there are zones which, as a result of an ecological " accident " or a combination of various factors, give origin to the gradual transformation of the normal or harmless phase *solitaria* into the destructive phase *gregaria* of the species. An identical phenomenon is also found in the independent and variable foci of gregarization, but it appears that in these foci the biological

evolution does not reach completion. That is to say, the resulting swarms have not shown to date the migratory threats so typical of the swarms produced in the two larger areas of gregarization.

The map presents a provisional sketch showing the present locust situation in the Mexico–Central America region as outlined above.

The losses caused by all types of migratory locusts in the area comprising Central America and Mexico are enormous. The locusts attack with remarkable ferocity all the crops they encounter in their path: cotton, sugarcane, banana, maize, cereals, fruits, vegetables, etc. Few plants escape the attacks. Among these, coffee appears to be repulsive to the insect but it suffers greatly indirectly, since the locusts devour with extreme voracity the dense foliage of trees and bushes planted in coffee plantations to provide the necessary shade.

### *Anti-Locust Organization*

One example alone will give an idea of the cost of locust control. The recently created inter-governmental organization, the International Committee of Co-ordination for Locust Control, has spent in little more than a year almost one-third of a million of U.S. dollars. To this sum should be added the crop losses sustained despite control measures, and the employment of manpower which would be used otherwise in productive work, by both the Committee and by the national anti–locust campaigns.

The International Committee of Co-ordination for Locust Control is an inter–governmental body established in 1949 under a special Convention by the Governments of Mexico, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. Each contracting Government has assigned one technical officer to this Committee and contributes in finance and materials. The Committee has its headquarters in Managua, Nicaragua.

The functions of the Committee are as follows:

(*a*) to co-ordinate all anti–locust research in the area;
(*b*) to assist materially individual signatory countries in the control of important local locust outbreaks;
(*c*) to advise member governments on the best methods of locust control;
(*d*) to carry on research on all phases of the locust problem;
(*e*) to find and supervise the locust outbreak areas in an effort to prevent future outbreaks.

FAO is co-operating very closely with this Committee and has been named as its permanent technical adviser. Furthermore, FAO has provided a locust expert who has been working with the Committee since March 1951 to assist in the research and other aspects of the locust problem in the region.

From early 1950 to the end of 1951 the Committee has, in co-operation with the national anti–locust campaigns, successfully brought to an end one of the major locust outbreaks in the region. The locust expert of the Committee has been studying the various locust species and has succeeded in recognizing and defining the various phases of the most important migratory species mentioned above. He has also discovered the main outbreak centres which may be supervised so that major outbreaks in the future may be prevented.

## Digest of Plant Quarantine Regulations

FAO will issue a revised edition of this publication in November of this year as an Agriculture Development Paper. It will contain abstracts of quarantine legislation governing imports of plant materials of 40 countries based upon official documents submitted to FAO by its Member Governments. In making this volume available, it is hoped to bring about a better understanding among FAO Member Nations, and thus establish a basis for future international co-operation on problems relating to plant quarantine. For plant protection officers and those who are concerned with imports and exports of plants and plant products, it may serve as a convenient reference. Supplements to this publication will be issued from time to keep it up–to–date and to cover additional countries.

# Pineapple Diseases and Pests in Mexico

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OBSERVATIONS of pineapple problems upon which this report is based were made in June and July 1951, mainly in the area of major pineapple production around Loma Bonita, Oaxaca. This area lies near 18° north latitude. It is approximately 70 km. inland from the Golfo de Campeche, and is only some 50 to 100 m. above sea level.

No adequate climatic records for this area could be found, but records from the San Cristobal sugar mill should be somewhat representative. This general area is characterized by a severe dry season with little rainfall between December and May. The total rainfall, amounting to 1,413 mm. or 55.6 in. per year at San Cristobal, should be sufficient for pineapple; and I saw no persistent evidence of drought injury from the 1951 dry season with the exception of a few places with apparently thin, eroded soil. In contrast with some areas in Hawaii where severe drought usually occurs during the maturing and ripening of the crop, this part of Mexico seems to have ample rainfall at that time to allow fruits to fill out normally.

Temperature in this region is less favorable. At San Cristobal, the monthly means vary from the minimum of 20.3° C. (= 68.5°F.) to the maximum of 28.1° C. (= 82.6° F.). The warmer months here are warmer than in the plantations of Hawaii and Philippine Islands. Actually, it is only from November to February that monthly means at San Cristobal drop below the warmest month in those island plantations.

At San Cristobal the warmest month is May, just before the rains begin and when the pineapple harvest is beginning. In Hawaii, on the contrary, the warmest months come after the heaviest harvest, usually in August or September at Wahiawa. The developing and maturing fruits in Mexico are thus exposed to much higher temperatures than in regions where the pineapple canning industry is now most successful. This apparently is significant in relationship to disease problems.

The Smooth Cayenne pineapple that is grown in Mexico for canning is the same variety as in Hawaii, yet appearance of the plant in very different. The typical plant in Mexico is larger and softer, with greener leaves showing less anthocyanin, than in any but the warmest locations in Hawaii. These characteristics indicate relatively poor accumulation of storage carbohydrates when high temperatures cause rapid respiratory losses.

## *Marbled Fruit, a Serious Bacterial Disease*

This bacterial disease is known under several names in literature, such as fruitlet black rot, fruitlet brown rot, and bacterial fruitlet rots. However, it is not as typically a disease of fruitlets, nor a rot in the usual meaning. Marbled fruit, the name used consistently in Hawaii, is more apt, suggesting the characteristic symptoms.

Where the Cayenne variety pineapple has been grown for canning in warm climates, marbled fruit has been a leading problem. In both Haiti and the Philippine Islands, this disease has been reported to cause heavy losses of fruits. Indirect evidence also suggests that it has been serious in Cuba. In Hawaii, however, where marbled fruit has long been known, it rarely has affected as much as one percent of the crop from any field.

In the main pineapple canning region of Mexico, near the border of the states of Vera Cruz and Oaxaca and south of the city of Vera Cruz, marbled fruit first caused alarm in 1949 when 38 to 40 percent of the fruits were marbled during one week in May, at the start of the canning season. The incidence of the disease then declined as harvest progressed.

In 1950 and again in 1951 there was as much as 30 percent of the disease for a short time. As late as 2 July 1951 I saw fruit from Los Tigres with about 30 percent diseased; and it had been still worse earlier. In general, however, in all three years that it has been observed, this disease has been most abundant among fruits that ripened early, and then has declined to low percentages or mere traces by late June or July.

Marbled fruit is characterized by speckled browning and by abnormal hardening of the internal tissues. Browning varies from bright yellowish or reddish–brown to very dark dull brown: it may occur chiefly as speckling and streaking, or in large continuous masses of tissue with only a little speckling. Hardening is most pronounced in tissues that are brown, or that at least are slightly speckled, but adjacent tissues of normal color may be abnormally crisp. These symptoms may extend throughout the flesh of the entire fruit or they may be variously restricted, sometimes being limited to a single fruitlet. The fruit surface, however, shows no conspicuous symptoms.

This disease seems to develop very rapidly and only during the ripening process. There seem to be no records of this disease in Mexican fruits picked green and allowed to finish ripening during transit and marketing in the U.S.A., even among fruits picked during a period when the incidence of diseased fruits at the cannery is high.

Marbled fruit is a bacterial disease, or a group of very similar diseases, caused by several distinct species of bacteria. The symptoms of marbled fruit can best be regarded as results of a peculiar fruit tissue response to any one of several unrelated bacteria that are capable of invading the intercellular spaces of ripening fruits.

Nothing is yet known concerning the life of these bacteria outside the fruit. Methods have not been developed for the selective culture of these bacteria to facilitate their recognition when they occur in mixture with other bacteria outside diseased pineapple. It seems probable, however, that the bacteria are carried about by insects that introduce them into the stigmatic fluid or the nectar of open blossoms.

Satisfactory control of this disease by means of bactericidal sprays or dusts seems improbable, despite a report of partial success from the Philippines.

For the present time, resistant varieties also afford no solution of the problem because only the susceptible Cayenne variety is acceptable for canning. Breeding a new variety that would combine the quality of Cayenne with resistance to the disease could not solve the problem for many years, owing to the extremely slow rate of vegetative multiplication of pineapple.

Cultural practices that will reduce susceptibility of the Cayenne fruit or that help to escape infection are probably what we must rely upon to reduce losses from marbled fruit.

The warmer pineapple–producing areas of the world where marbled fruit has been a serious problem are also areas in which fruit acidity is low. In Hawaii, the greater acidity of fruit may well be one of the chief factors that limit its prevalence. Haiti and Mexico are both characterized by much warmer climates than Hawaii, and in both, the disease has proved especially severe during the warmest months. Also, in both, the summer fruits are less acid than in Hawaii. Data available in Mexico indicate that decline in incidence of marbled fruit with advance of the harvest through June and into July is associated with increase in the fruit acidity. From Hawaii the evidence seems ample that high temperatures during maturation and ripening result in lower acidity.

These relationships suggest some possible means of reducing the disease. If marbled fruit is always more severe in May and June than during other months, as it has been during 1949, 1950 and 1951, then means of reducing the proportion of the crop that ripens during this period appears to merit serious experimentation.

If acidity of the fruit exerts as much influence upon marbled fruit as it appears to do, then cultural practices that increase acidity should be helpful. Obviously, culture at high altitudes where temperatures are lower should help if it were feasible. In addition to regulating the time of ripening, other means appear possible.

Experience in Hawaii shows that, among fruits from a single picking from one field, the larger fruits have lower average acidity. This agrees with data obtained in Mexico,

showing most marbling in large fruits and least in small fruits, all picked from the same field. The cause of this variation is not known, but limitation of size by close spacing of plants seems worth testing.

Shading plants and fruits in Hawaii has made fruits more acid but, unfortunately, it has also reduced sugar content as well as fruit weight. Close spacing of plants, of course, results in a type of shading of the fruit, but its effect on fruit temperature might be very different from that of an umbrella-type shade that would not greatly obstruct circulation of air.

The agricultural practice that seems most likely to help in control of marbled fruit is the use of potash fertilizers. Evidence indicated that the application of potash may materially increase fruit acidity.

Unless the Mexican soils are amply rich in available potash, which seems unlikely, the use of potash fertilizers should give some degree of disease control; but many experiments will be required to determine its magnitude and to learn the most advantageous rates and time of application for different soils.

### *Other Diseases and Pests*

This limited study indicates that Mexico is fortunate in not being troubled, at present, with some of the serious disease and pest problems that occur in Hawaii and elsewhere. Pineapple yellow spot, caused by the virus of tomato spotted wilt, for example, is a disease that might be very severe among the soft type plants if it were introduced into Mexico.

In the following paragraphs are recorded some observations that may be of interest concerning problems to be avoided, and diseases or pests now present in Mexico.

**Mealybugs and wilt.** In Mexico I saw no definite example of mealybug wilt, so far attributed to toxic secretions of *Pseudococcus brevipes*. Small numbers of mealybugs of this species were found frequently, but only in protected positions below the soil line, never on young leaves in the center of the plant where they commonly feed when causing wilt. In the Loma Bonita area I saw plants that looked as if they might have been affected by wilt some months ago, but without any definite evidence that mealybugs were the cause.

**Terminal mottle.** This is a pathological condition, known in Hawaii under this name since 1935. The nature of the disease is still imperfectly known.

Terminal mottle is characterized by reduced plant vigor, and by a more distinctive wilt-like mottling and collapse of leaf tips that occurs chiefly after plants are 10 to 14 months old but before their fruits ripen. Leaf tips become abnormally red or yellowish and then, with irregular loss of chlorophyll, develop an irregular pattern of mottling of green yellow, and red. The tip becomes thin and soft, and the margins recurve. Finally the mottled tissues all die. Affected plants may fruit tardily and may fail to produce any ratoon crop at all.

Terminal mottle is perpetuated indefinitely by vegetative propagation from affected plants. Because affected plants are weaker than the normal and tend to produce fewer slips or suckers for planting, the selection of vigorous planting material tends to eliminate the more severe strains of terminal mottle.

Plants with the typical symptoms of terminal mottle were seen in fields in the Loma Bonita area. I had earlier, during the 1930's, seen this disease in plants grown under quarantine in Honolulu from suckers of Cayenne type imported from some part of Mexico.

**Nematodes and root diseases.** In general, pineapple roots seen in Mexico were remarkably extensive and healthy, especially in view of the usually poor preparation of the soil before planting. I saw no indication of any root rot caused by fungi, although it might occur during the rainy season.

Injurious nematodes, however, are already established widely in pineapple fields in the Loma Bonita area, both in lands that were formerly forest and those that were grassy plains. Perhaps most destructive of the nematodes that attack pineapple roots are the rootknot nematodes (species of *Meloidogyne*, formerly called *Heterodera marioni*).

The characteristic galls were found widely in the Loma Bonita area, occurring both on pineapple roots and roots of weed plants in pineapple fields. In one field, growing what was said to be its third crop of pineapples,

severity of root knot was associated with low vigor of plants, with narrow leaves and reddish color. In no observed instance, however, was root knot as severe as it commonly is in the older fields of Hawaii.

Other nematodes frequently extracted from pineapple roots were species of *Pratylenchus* and *Rotylenchus*. Species of *Rotylenchus* are of questionable significance as root pathogens, but the several species of *Pratylenchus*, known as meadow nematodes or root-lesion nematodes, are capable of serious injury to roots when abundant. No evaluation of damage they cause was possible during these observations, and the specimens collected have not yet been identified as to species, but members of this genus were found with sufficient frequency to suggest that they may cause serious root disease if pineapple culture becomes intensive.

For the control of these diseases, it would seem feasible to avoid frequent replanting of pineapple in the same fields, and that attention be given to finding nematode-resistant plants suitable for use as green manure crops in old pineapple fields to occupy the land and to prevent growth of weed hosts of the pineapple nematodes. A few years between plantings of pineapple may serve to prevent serious increase of nematodes if the land is occupied by resistant plants.

**Heart rot.** In some fields at Los Robles there were found irregular areas in which heart rot had killed all or nearly all of the original plants and many of the replants as well. The cause was identified as some species of *Phytophthora*.

Mehrlich [1] described a method of control of this disease that has proved useful in Hawaii except where *Phytophthora cinnamomi*, which causes also root rot, is the pathogen. Slips or other planting pieces that are to be set as replants where original plants have failed, or that are to be planted in areas where this disease is to be expected, are dipped in a heavy Bordeaux mixture and planted immediately or after drying. This treatment is not wholly satisfactory, because the pineapple is so sensitive to copper that treated plants do not grow as well as untreated plants where the disease does not occur.

[1] MEHRLICH, F. P. Control of *Phytophthora* heart rot of pineapple plants. Phytopath. 24: 173-196. 1934.

**Red mite injury.** Severe injury caused by a red mite was seen in one field, with lesser infestations in some other fields. Specimens collected in the heaviest infestation were identified as *Stigmaeus floridanus* Banks, known widely where pineapples are grown. This mite feeds in colonies on white tissues at the bases of leaves, especially of slips and crowns, causing brown areas which at first are superficial but that may then rot. Severe infestation of planting material may cause the young plant to make very poor growth or to rot and die.

In the severely infested field I saw on high ground east of Loma Bonita in the Los Llanos area, the crowns of mature fruits bore very heavy infestations at leaf bases, with many feeding scars on older green parts of leaves. The mites also were abundant in the "blossom cups," under the overlapping sepals, and injury to the linings of these cups had resulted in decay extending into the fleshy tissues of the fruit to a depth that would interfere with canning. On these same plants the slips also were heavily infested, rendering them unfit for planting.

**Pineapple borer.** The large larvae of a lepidopterous insect, *Thecla* sp., is already well known to the Mexican investigators as an agent of destruction of fruits. The injury caused by this borer was seen more abundantly at Los Robles, near Vera Cruz, than elsewhere. It is said to be especially prevalent in fall and winter.

**Cripple.** Cripple is a deformity of fruits reported from Queensland and Hawaii. The cause has not been determined. In Mexico, it was seen several times but too rarely to suggest economic importance. In one field at Los Robles, however, the dark stripe on leaves was so frequent in association with affected fruits as to suggest that this trouble may at some time assume economic significance.

**Fasciation.** Where soils are excessively fertile and where both temperature and soil moisture favor vigorous growth, plants may develop monstrous fasciated fruits that are utterly worthless. Milder degrees of fasciation may involve only the upper part of the fruit and its crowns or may be manifest only in the production of two or more crowns instead of the one crown normally produced.

Few examples of multiple crowns were seen in Mexico. Severe fasciation was observed in two localities, at Estación Isla and at Los Robles.

**Cork spot.** This disease is characterized by firm corky masses of brown tissue, usually 2 to 5 mm. in diameter situated on nectary ducts and not deeply embedded in the flesh. These spots generally have at least a small internal cavity in which micro–organisms are found, usually *Penicillium* in Hawaii. Basically, however, cork spot does not result from infection.

After nectary duct walls have hardened, growth stresses may be sufficient to tear across the hardened duct. If this happens while the fruit is still immature, wound cork forms around the break. Continued enlargement of the fruit may in turn tear the first layers of cork, causing more to form and finally developing the corky mass with hollow center.

If such breakage of ducts or of cork spots occurs during ripening, juice may ooze into the duct. Such juice serves as a nutrient for micro–organisms, which may invade the fruit through the wound, causing one or another type of disease depending upon the type of pathogen. This may be one way in which bacteria enter to cause marbled fruit.

Cork spot, and the slow fungus rots often spreading from it, were seen repeatedly in canneries in Mexico but not in sufficient abundance during the period of this study to suggest much importance.

**Fruitlet core rots.** Light, medium or dark brown lesions that are entirely or chiefly restricted to the ovarian septa of a fruitlet core, and that are not characterized by either hardening or speckling of the brown tissues, are designated fruitlet core rots. Various micro–organisms are capable of causing such rots, including fungi of the genera *Penicillium* and *Fusarium*, certain " imperfect " or asporogenous yeasts, and some bacteria. Only a few typical specimens of fruitlet core rot were observed in Mexican canneries.

**Glassy spoilage.** This disease is the result of invasion of the ripening fruit by any one of several yeasts or yeast–like fungi that produce little or no gas. Affected tissues are abnormally translucent or glassy in appearance but are only very slightly brownish in color and are characterized by an abnormal but not unpleasant fruity aroma. Only a few specimens of this disease were observed in canneries at Isla and Loma Bonita.

# Observations on Insect Pests in Israel

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## *Lixus on Sugar Beet*

One of the limiting factors in the cultivation of sugar beets in Israel is *Lixus junci* Boh. The damage in some years has been estimated as high as 50 percent with an average of 20 percent. While the writer travelled in Huleh district around the middle of July this year, larvae, pupae and adults of this insect were found in abundance. Leaves attacked by the weevil quickly wither and fall. The larvae also cause a rot to develop.

This beetle is an endemic pest in the Mediterranean basin and has been reported as a serious menace to beets in Morocco and Italy. In Israel, it has also been known to exist for many years and is widely distributed from the Huleh valley in the north, the Upper Gallilea, the Jordan valley, as well as in the central and southern parts. Its southern limit is the northern border of the Negev. The highest population density occurs in three zones:

(1) The Huleh valley.
(2) The Ramleh–Lydda area, 15–20 miles east of Tel–Aviv.
(3) The southern part of Israel, 40–60 miles south of Tel–Aviv.

Until 1950, when the cultivation of sugar beet was introduced into Israel, the main host of the cultivated plants for *Lixus* was the fodder beet. The growing season of the fodder beet is from September to June. The farmers could have prolonged the growing season up to July, a practice which could be of great advantage for the economy of cattle feeding, but is practically impossible due to the heavy attack of the second generation of *Lixus*. Unless the farmer is willing to risk a loss of 50–60 percent of the crop, or major control measures are taken to annulate the *Lixus* damage, there will be no possibility of starting to harvest later than the beginning of June.

In Israel, it has been planned to extend the cultivation of sugar beets in order to build up a sugar industry. Climatic and agrotechnical studies, which have been done during the last three years with the help of a specialist of FAO, have proved that sugar beet growing in this country is possible in large areas. But in order to have a continuous supply of sugar beets for the factories it is necessary to prolong the growing season during the summer or start sowing in March. Obviously this cannot be done until *Lixus* has been controlled.

It was estimated in July 1951 that the damage caused by *Lixus* amounted to about 60 percent of the sugar beets grown in the Ramleh–Lydda zone. In the nearby fields of fodder beet which were harvested at the beginning of June 1951 the loss was about 20 percent of the total yield.

During 1952, the farmers started harvesting the fodder beet in the middle of May and at that time only 10 percent of the beets were infested by the *Lixus* beetle. Two weeks later the degree of infestation reached 18–20 percent. Also, most of the sugar beet was harvested early in June with a loss of only 15–20 percent. In the Huleh area, however, the harvest was done late in July with much heavier damages.

No exact data on the biology and seasonal development of the *Lixus* in Israel are available at present. Plans for such studies have been made and are being carried out during the current year.

From the observations made up till now, we know that the adult beetles appear at the end of February on beets. After copulation, egg–laying begins in March and continues until May. At the end of May and beginning of June the adults emerge. The second generation, which is heavily populated and is the most dangerous, starts from June to August.

Experiments on the control of this insect with insecticides will be carried out by the Division of Plant Protection at Jaffa. In Italy and Morocco, natural parasites have been released for controlling *Lixus*, but the feasibility of adopting this measure in Israel has yet to be studied.

### *Spiny Bollworm on Cotton*

The spiny bollworm (*Earias insulana* Bsd.) is a major pest of cotton in Israel. It is active from May to December. The worms feed on young squares and bolls, which soon dry up or fall off. This year more than 90 percent of the cotton crop was thus destroyed.

### *Oriental Hornet*

The oriental hornet (*Vespa orientalis* F.) is an omnivorous feeder. It catches honey bees and often destroys 30 to 50 percent of the bees in an apiary. It also attacks ripe fruits, such as grapes, pears etc. Dates can only be saved by covering them with paper bags. The hornet gnaws the bark of young trees, often killing young citrus and pear trees from August to October.

The queens of the hornet appear in April and the workers in June. Breeding continues until the end of November, when the pest is destroyed by winter rains.

This insect is controlled by a bait consisting of meat plus a poison. Since meat is now expensive, the use of cheaper sources of protein is being explored.

# Insect Problems in Nicaragua

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THE Department of Entomology, a branch of the Nicaraguan Technical Agriculture Service, established in July, 1951, is headed by the writer, who is working in Nicaragua under the Point Four Program. He has at present three assistants, Senores Fernando Salgado, Adolfo Berríos and Humberto Vigil.

Although most of the work during the first year of operation of the Department was concentrated on the control of insects injurious to cotton, attention was also given to pests of other crops and cattle. Among the former are included the boll weevil, cotton leafworm, bollworm (maize-ear worm and tomato–fruit worm), false pink bollworm, aphids, cutworms, stain bugs and red mites. Among the latter are sugar cane billbugs, coffee hoppers, banana stem weevils, coconut palm weevils, cattle warbles and screw worms.

Extension circulars on the control of cotton pests and banana stem weevils (*Cosmopolites sordidus*) have been distributed. Others on warbles (*Dermatobia hominis* Linné, Jr.), screw worms (*Cochliomyia americana* C. and P.), cutworms (*Feltia* spp.) and other plant and animal pests are forthcoming.

## *Cotton Insects*

During the crop season in 1951 the boll weevil (*Anthonomus grandis* Boheman) and the cotton leafworm (*Alabama argillacea* Hübner) were particularly destructive. In September 1952 these two pests were again prevalent in the cotton plantations which were 3–6 weeks old. The leafworm was particularly abundant in many localities. A new insecticide from the Bayer company, Folidol E–605–m, has been very effective in controlling both species of insects.

The boll weevil is controlled by early and late applications of 1.5 percent Folidol dust at the rate of 7 and 15 pounds per acre, respectively. Other effective insecticides include Cotton Dust 3–5, Toxaphene 20 percent, Aldrin 2.5 – DDT 5 percent and Chlordane 10 – DDT 5 percent applied at the same rate. Early treatment starts at the four-leaf stage; late applications are scheduled according to percentage of perforated bolls in a random sample and distance from other infested fields. When 10 to 25 percent of bolls are infested the insecticides are applied at 3–5 day intervals.

The cotton leafworm is controlled when larvae appear, by Folidol, Cotton Dust, Toxaphene and calcium arsenate, at the same rate as for boll weevil.

The false pink bollworm (*Sacadodes piralis*) which is also found in South America, has been found for the first time in Nicaragua where it probably has been established many years causing considerable damage to cotton. Its parasite, *Apanteles thuberiae* Mues., a Braconid wasp, is also established in Nicaragua. No satisfactory control has been obtained by the use of insecticides, although some benefit is obtained by the application of Toxaphene – DDT as above when eggs or larvae are observed at earlier stages of development, repeating at intervals of 4–5 days. Likewise beneficial are the eradication of post–harvest debris, uniform planting dates and early maturity of the crop.

Other insects which damage the cotton boll include corn ear worms (*Heliothis armigera* Hübner), cutworms (*Prodenia latisfacia*) and common corn–stalk borers (probably *Papaipema* sp.). Of these the former is most prevalent in Nicaragua. Insecticides are not applied except when these insects become numerous, to avoid injury to their natural parasites. Ten percent DDT is the most effective insecticide either alone or mixed with 20 percent Toxaphene or 3 percent BHC at the above rate for false pink bollworm.

Aphids and cutworms, in addition to the boll weevils, are destructive to young cotton plants. Insecticides effective against boll weevil such as Folidol, Toxaphene and Cotton Dust control the aphids.

Cutworms usually affect limited areas of the field and can be controlled effectively by local applications of Toxaphene, Cotton Dust or Chlordane at slightly heavier dosages than given above for boll weevil.

Stain insects (*Dysdercus* spp.) are flat, narrow, long–legged plant bugs whose red nymphs are observed in the opening bolls. They puncture the seeds in feeding, permitting the entry of micro–organisms into the seeds and the exudation of an indelible yellow stain from the seeds which is absorbed by the cotton. These bugs are controlled in the same way as boll weevil.

Red mites are usually destroyed by rains but if they become numerous within 110–125 days after seeding they can be controlled by the application of twenty pounds of sulphur or between two and four ounces of Parathion per acre.

### *Insects of Other Crops*

In various sections of Nicaragua the sugarcane is attacked by two curculionids (billbugs) which cause considerable losses. The most important is the newly described *Nicentrus saccharinus* Marshall; the other is *Calendra incurrens* (Gyll). Only preliminary investigations on its life cycle and control have been made thus far.

To–date the most important insect in the coffee plantations is *Idiarthron atrispinum* Stal., a small orthopteron (grasshopper) of the family of Tettigoniidae. The biology of this insect has been studied in detail and control methods recommended. Aldrin 2.5 percent, Toxaphene 20 percent. or Chlordane 10 percent are effective when applied at the rate of 15 lbs. per acre as soon as the first insects hatch and emerge from the soil.

Bananas, abaca and plantains are attacked by a stem weevil, *Cosmopolites sordidus*, causing loss of plant vigor, chlorosis and terminal atrophy. Infestation of the stem base causes root atrophy so that the plants are frequently wind–thrown in wet soil. The larval tunnels permit entry and growth of stalk rot organisms resulting in death of the plants.

The biology of this insect has been studied in detail. The adult is a black weevil, approximately 1 cm. long having a curved beak and slow movements. They breed throughout the year and the eggs are inserted in punctures or other openings at the stem base and hatch in 3–5 days. The larvae are larger than the adult, curved, legless, cream colour with light brown heads and feed forming irregular tunnels. After 75–90 days they pupate for 10 days. All stages are found in the tunnels.

Since the adults are nocturnal, hiding by day under loose soil or debris, two control methods are recommended on the basis of these habits. One is to trap the insects by laying split sections of non–infested banana trunks with the flat side against the soil, collecting the insects daily and destroying the traps after a week of use. Another method is to compact the soil and to hill up the plants with compact soil to prevent egg deposition. In addition, insecticides are applied to plant wounds, stem bases and around split–stem traps. The most effective of these are 20 percent Chlordane or 2.5 percent Aldrin, although Paris Green and BHC are also effective.

Investigations on palm weevils (probably *Ryncophorus* spp.) are being made when time permits.

Many serious insect problems in Nicaragua require extensive investigation before appropriate control measures can be recommended.

# Outbreaks and New Records. July-August, 1952

## Netherlands New Guinea

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BACTERIAL wilt (*Pseudomonas solanacearum* E. F. Sm.) was in evidence in July and August near Manokwari on tomatoes and groundnuts. The groundnut variety Schwartz 21 was resistant. In the Island of Japen, moderate damage to tomatoes and eggplants was sustained.

**European corn borer.** European corn borer (*Pyrausta nubilalis* Hübn.) was observed on maize or Indian corn in the surroundings of Hollandia, Manokwari, Merauke, and also in the Island of Japen near Seroei and Ambai, causing limited damage. Early in July of this year, the borer was wide-spread in Hollandia, causing losses amounting to 70 percent in certain fields of maize. In August, however, it scarcely caused any harm. In seed maize, dusting with 5% BHC or 5 % DDT was used for controlling the pest.

**Coconut-tree hopper.** Coconut-tree hopper (*Sexava* sp.) caused localized damage in the coconut plantations in the Radja–Ampat Archipelago. *Sexava coriacea* has been found in the District of Seroei and in the Island of Sorong Doom, causing negligible damage only.

**Cabbage worms.** Cabbage reserves sustained damage by caterpillars of the diamond back moth (*Plutella maculipennis* Curt.) in the Island of Japen and in the surroundings of Manokwari, and by the larvae of tobacco caterpillar (*Prodenia litura* Fabr.) in the surroundings of Hollandia. Good control has been obtained by applying 5 % DDT dust every five to seven days.

**Giant snail.** Giant snail (*Achatina fulica* Fer.) was probably imported into Manokwari by ship from Indonesia in late 1949 or early 1950. Its occurrence is limited to the residential areas of the town of Manokwari, causing much concern. Measures have been taken to combat this pest by the use of metaldehyde baits in order to protect the smallholders and to prevent its further spread.

## New Zealand

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### *Epidemic outbreaks*

**Looper caterpillar on pine.** The endemic looper caterpillar (*Selidosema suavis* Butler) was first reported to be defoliating *Pinus radiata* at Eyrewell forest in Canterbury in December, 1951. An area of 450 acres had suffered partial defoliation and was threatened with complete defoliation. Reports in August of this year indicate that an epidemic is building up at Balmoral, Canterbury. Spraying with DDT by aircraft has been successfully carried out in controlling this caterpillar and studies on its parasites are under way. This pest is important because the host, *Pinus radiata*, is the most widely grown exotic softwood in the country. It should be noted that the epidemic has not been specific to the month of August, 1952.

**Manuka blight.** Manuka or broom–tree (*Leptospermum scoparium*), a flowering shrub, was damaged by mealy bug (*Eriococcus* sp.) in secondary forest and scrub in Canterbury, causing a disorder known as "manuka blight." Certain ornamental varieties of manuka are exported from New Zealand as nursery stock.

**Oak leaf miner.** Outbreaks of oak leaf miner (*Lithocolletis messaniella*) was found on a number of forest trees, such as *Quercus*

*rubra*, *Q. suber*, *Carpinus betullus*, *Parrotia persica*, and *Fagus silvatica purpurea*.

### *New Records*

**Azalea leaf miner** (*Gracilaria azaleella* Brants). This leaf miner occurred on rhododendrons and azaleas at New Plymouth and Auckland. The origin and means of introduction are not known. The infestation constitutes no potential danger.

**Scale** (*Parlatoria pittospori* Mask.). The scale was found on apples, *Pittosporum*, *Hakea*, and certain Australian shrubs.

**Mites** (*Eriophyes hoheriae* and *E. populnea*). Both mites appeared on the native tree, *Hoheria*, which is sometime exported as nursery stock in the variegated form.

**Stone fruit blast** (*Pseudomonas syringae* Van Hall). This bacterial disease of stone fruits at Roxburgh, Central Otago, has been known for some time now. The disease, which is similar to citrus blast, may cause loss of crop and eventually loss of the mature tree. At present the control measures go no further than pruning and burning of infected wood.

## PLANT QUARANTINE ANNOUNCEMENTS

### Belgium

Royal decree of 12 March 1952, concerning measures to be taken to prevent the introduction and spread of San José scale, as supplemented by two Ministerial decrees of 13 March 1952, revoked and replaced the Decree of 11 June 1947 on the same subject. These decrees were published in Moniteur belge, 24–25 March 1952.

Under these decrees, the importation into Belgium of living woody plants or parts of plants and their fruits is prohibited unless accompanied by a certificate of freedom of San José scale. Import can be made only through authorized customs offices. Consignments of certain living woody plants or parts of plants belonging to 24 genera shall be treated with hydrocyanic acid or other approved insecticides before admission and may be imported only between 1 October to 15 April except the grafts. Cut flowers of these plants and evergreen plants are exempted from treatment.

### Canada

The Destructive Insect and Pest Regulations issued 26 April 1949 are further amended by Order in Council P. C. 3811 issued 21 August 1952, which prohibits importation of (1) " plants with soil, sand, soil or earth, or packing material containing sand, soil or earth, from all countries in Europe except Holland and Belgium, and any other country in Europe which may later establish a golden nematode survey and control program, and export certification policy, on a basis satisfactory to the Destructive Insect and Pest Act Advisory Board "; and (2) willow plants from Europe. Restrictions on the importation of maize and broomcorn, and propagating material of stone fruits and hops, will be noted in the next issue.

### Ecuador

Presidential Decree No. 0299 of 15 February 1952 contains regulations governing the introduction into Ecuador of all species of living plants, including cuttings, suckers, buds, bulbs, fruits, and seeds, intended for propagation. The importation of any propagating plant material should be accompanied by a phytosanitary certificate, in accordance with the model given in Article 6 of the Inter–American Convention of Plant Protection.

An additional document is required, guaranteeing the certification of such material by the Government, and its purity, germination capacity and freedom from weeds and harmful seeds as examined immediately before shipment. The document must also indicate the names of the producer and the sales agent. The provisions of the decree shall be enforced by the Technical Division of Agriculture of the Ministry of Economy.

### France

Order of 5 March 1952, relative to the hygienic control of imported plants and to the fixing of inspection fees, was published in the Journal Officiel No. 56, 14 March 1952 and was rectified in Nos. 79 and 89 of 30 March and 11 April, 1952 respectively.

The order provides chiefly that the following items and their containers may not be imported, even if accompanied by a health certificate, without inspection by the French Plant Protection Service at declared customs offices.

(*a*) Living plants and floricultural products, except flowers and dried or dyed leaves, etc.

(*b*) Vegetables, plants, roots and tubers for human food, except vegetables and food plants in a desiccated, dehydrated or evap-

orated state and roots and tubers with a high starch content.
(*e*) Edible fruits.
(*d*) Green coffee, in the form of berry, parchment, bean or skin. Pepper (forms of *Capsicum*, excepting *C. grossum* and pimenta), paprika and other peppers.
(*e*) Cotton seeds, seeds and fruits for sowing, with the exception of graminaceous seeds and particularly of ryegrass.
(*f*) Fresh or sliced willows.
(*g*) Cocoa in beans and broken beans (not roasted), or any part of the bean.
(*h*) Soil destined for cultivation.
(*i*) Natural manure of plant origin.

## Japan

New Plant Quarantine Law Enforcement Regulations were issued in May 1952, as Amendment Agriculture and Forestry Ordinance No. 36. The major amendments introduced in these Regulations include the prohibition of importation of the following plant materials:

(*a*) fresh fruits of apple and other *Malus* and *Crataegus* plants from China;
(*b*) rice straw and its processed goods, seed of rice and chaff from all foreign countries, except Formosa, Korea and the Ryu Kyu Islands.

## New Zealand

Plant Quarantine Regulations were issued on 25 June 1952 and came into force on 26 September of the same year. These regulations consolidate and amend the regulations under the Orchard and Garden Diseases Act of 1928 and the Stock Act of 1908. Quarantine procedures have been adapted in the light of those in force in overseas countries and so as to take into account modern methods of transport. The regulations provide for the

(*a*) prohibition and control of the importation of fruit, plants and plant products;
(*b*) post-entry quarantine of seed potatoes and nursery stock;
(*c*) inspection and treatment of overseas aircraft;
(*d*) control of the introduction of soil.

## Norway

The Norsk Lovtidend No. 21, published on 31 May 1952, contains three official statements from the Department of Agriculture dated 20 May, prohibiting imports of the following plant material:

(1) Living plants and parts of plants, except seeds, of *Pinus flexilis*, on account of white-pine blister rust (*Cronartium ribicola* Fischer).
(2) Barberry (*Berberis vulgaris*), including its varieties and hybrids, and barberry plants grafted with this species.
(3) All species of the genus *Ulmus*, bark of elm, and all materials manufactured of elm with bark on, on account of *Ophistoma ulmi* (Buism.) Nannf. (= *Ceratostomella ulmi* Buism.; *Graphium ulmi* Schwarz).

## Sweden

Royal Decree of 5 May 1952 restricting the import, sale and planting of barberry, was published in Svensk Författningssamling No. 222–223 on 20 May 1952. It provides that bushes of *Berberis*, including *Mahonia* and *Mahoberberis*, are allowed entry, sale or planting only with the permission of the Plant Protection Institute. This restriction does not affect the transit of such material through Sweden if it is sealed by the Customs House at the port of entry. Importation, however, is prohibited from countries where foot and mouth disease is found.

The above-mentioned Decree is modified by a circular of the Plant Protection Institute of 1 July 1952, as published in the same journal No. 621–622 on 22 August 1952. The circular lists the following species of *Berberis* as enterable, provided not grafted on other species:

*Berberis aggregata*,
*B. aggregata prattii*,
*B. buxifolia nana*,
*B. candidula*,
*B. chenaultii* (= *gagnepainii* × *verruculosa*),
*B. gagnepainii*,
*B. julianae*,
*B. koreana*,
*B. mentorensis* (= *julianae* × *thunbergii*),
*B. parvifolia*,
*B. sargentiana*,
*B. thunbergii*,
*B. verruculosa*,
*B.* (*Mahonia*) *aquifolium*.

## Trust Territory of the Pacific Island, U.S.A.

Executive Order No. 23, which revises Plant and Animal Quarantine Controls and Regulations, was issued on 4 March 1952. All animals, plants, aircraft and vessels entering or moving within the Trust Territory are subject to inspection. Agricultural Quarantine Inspectors will be located at Saipan, Majuro, Palau, Truk, Ponape, Ebeye, Tinian, Yap and Kusaie.

Living plant material intended for propagation is permitted entry into or movement within the Territory only after a permit has been issued. Field, vegetable and flower seeds are not subject to this restriction. Importation of vegetables and fruits, except those from U. S. A., also requires a written permission, but certain specified items are enterable without restriction from Guam, Japan, Bonin Islands and Volcano Islands.

The following plants, animals and articles are prohibited entry into or transport within the Territory:

(1) Living insects and snails except for experiments or biological control.
(2) Animals other than domestic animals except for specific purposes.
(3) Coconut trees and unhusked coconuts.
(4) Soil, except clean sand and sterilized soil.
(5) Packing material of plant origin, except coconut frond baskets and banana leaves.
(6) *Lantana camara*, cacao and citrus (any member of the subfamily Rutelinae).

### Union of South Africa

Proclamation No. 80 of. 22 March 1952, published in Government Gazette No. 4836 on 2 May 1952, prohibits the introduction into and the removal within the Union of all species of ergot (*Claviceps*) and infected plant material, except with a written permission from the Union Department of Agriculture.

## NEWS AND NOTES

### Third South American Botanical Congress

The Third Congress will be held in January 1953 in Bogotà, Colombia, under the auspices of the Ministry of Education of Colombia. It will contain 25 sections covering every branch of botany, including a section on phytopathology and mycology. Dr. E. Pérez-Arbeláez and Miss Teresa Arango-Bueno serve as the President and Secretary respectively on the Organizing Committee, and Ing. Agr. J. Orjuela Navarrete as the Sub-Secretary of the Section of Phytopathology and Mycology. Any enquiries about this Congress should be directed to the Organizing Committee, Carrera 10ª, No. 16-65, Apartado aéreo 5312, Bogotà.

### Third International Congress of Crop Protection

The Third International Congress of Crop Protection, following the trend of the 1st and 2nd Congresses, was devoted to the chemical control of crop pests and diseases. It was held at the Sorbonne, Paris, on 15-20 September 1952, and was attended by nearly 900 delegates from about 30, mostly European, countries. Many manufacturers of pesticides were represented.

The Congress was opened in the morning of 15 September, by President Jean Lefèvre, followed by an inaugural lecture by Dr. P. Muller on the development of phytopharmacy for protecting crops. During the Congress, four other lectures were also given on the following subjects:

(1) Benzene Hexachloride, by M. Raucourt and A. Dupire.
(2) Antibiotics in crop protection, by H. Darpoux.
(3) Systematic insecticides, by Dr. W. Ripper.
(4) Growth substances in crop protection, by Prof. P. Chouard.

Technical reports, altogether about 170 in number, were presented during the afternoons. For the presentation of these reports, the Congress was divided into the following sections:

*Sect. I and II.* Chemical, physical and physicochemical studies.
*Sect. III A.* Physiological properties of growth substances and analogous materials.
*Sect. III B.* Study of methods for testing insecticides, fungicides and herbicides.
*Sect. IV A.* General toxicological studies of insecticides.
*Sect. IV B.* Toxicological studies and experiments on the practical uses of aphicides, coccicides, acaricides, nematicides, and systematic insecticides.
*Sect. IV C.* Toxicological studies and experiments on the practical uses of products for soil treatment and for treatment of grains and seeds.
*Sect. IV D.* Toxicological studies and experiments on the practical uses of insecticides for various parasites.
*Sect. IV E.* Study of products for controlling harmful vertebrates.
*Sect. V A.* Mode of action of products for controlling cryptogams.
*Sect. V B.* Study of herbicides.
*Sect. VI.* Equipment for pest control treatments.
*Sect. VII.* Economic and legislative problems.
*Sect. VIII.* Toxicological studies.
*Sect. IX.* Various current topics.

The closing session on 18 September was dedicated chiefly to the presentation of summarized reports by the Chairmen of different sections and was highlighted by an address of the French Minister of Agriculture.

During the last two days, exhibitions and demonstrations of pesticides and equipment for application of pesticides were on display at Senlis.

Roma – Tipografia del Senato del dott. Giovanni Bardi

## SOME FAO AGRICULTURAL STUDIES

***Efficient Use of Fertilizers.***

A guide book on fertilizers and their use in crop production. Available in French and Spanish from FAO and FAO sales agents, in English from Leonard Hill Limited, Stratford House, 9 Eden Street, London, N. W. 1. $ 2.00 10/–.

***Improving the World's Grasslands.***

An international study giving the latest information on grassland improvement. English edition available from Leonard Hill Limited. French and Spanish editions in preparation at FAO. $ 2.00 10/6.

***Weed Control by Growth-Regulating Substances.***

A short practical guide to the use of hormone weedkillers. In English, French and Spanish. $ 0.50 2/6.

## Some Available Publications of the Former INTERNATIONAL INSTITUTE OF AGRICULTURE 1910-1946

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| *Actes de la Conférence internationale pour la protection des plantes. Rome 10-16 avril 1929.* French edition only. | $ 1.00 | 5/– |
| *Actes de la Conférence internationale pour l'organisation de la lutte contre les sauterelles. Rome, 28-31 octobre, 1920.* French edition only. | $ 1.00 | 5/– |
| *Conférence internationale du blé, préparatoire de la IIème Conférence mondiale. Rome, 26 mars - 2 avril 1931. Actes de la Conférence.* French edition only. | $ 2.00 | 10/– |
| *Documentation concernant les réunions du Bureau de la Commission pour l'agriculture des pays tropicaux et subtropicaux du Conseil international scientifique agricole, 1932.* French edition only. | $ 1.00 | 10/– |
| *Actes de la Conférence diplomatique internationale pour l'unification des méthodes d'analyse des vins dans le commerce international. Rome, Juin 1935.* French edition only. | $ 0.50 | 2/6 |
| *Documentation for the European Conference on Rural Life, 1939.* In English and French. | $ 1.30 | 6/6 |
| *Le climat du blé dans le monde. Les bases écologiques de la culture mondiale du blé, 1930.* French edition only. | $ 5.00 | 25/– |
| *Le service de protection des plantes dans les divers pays - 3rd edition, 1914.* French edition only. | $ 2.00 | 10/– |
| *La lutte contre le sauterelles dans les divers pays, 1916.* French edition only. | $ 1.00 | 5/– |
| *La lutte contre la mouche des olives dans les divers pays, 1922.* French edition only. | $ 0.50 | 2/6 |
| *Etat actuel de l'organisation de la lutte contre le sauterelles dans divers pays, 1926.* French edition only. | $ 0.50 | 2/6 |
| *Le « Soune » ou « Sen » Eurygaser intergriceps et ses dégats en Syrie et en Perse, 1927.* French edition only. | $ 0.50 | 2/6 |
| *The Loss to Agriculture caused by Factory Fumes, 1927.* In English, French, German and Italian. | $ 0.50 | 2/6 |

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